



Grade 8 Mathematics

Released Items

Winter 2002

Item 29

29 Michigan leads all states in the building of transportation equipment. The mass production of automobiles began in Detroit in 1901 when a company founded by Ransom E. Olds made about 400 cars. By 1904 the Olds plant made 5,000 cars a year.

A If a constant rate of increase continued, how many cars did the Olds plant make during 1907?

Show your work.

B During 1910? Show your work.

Item 29: Scoring Rubric**MEAP Grade 8 Math 2002****Item # 29 Rubric**

A **4-point** response does all of the following:

- Correctly indicates that the plant made 9,600 cars in 1907 (rounding may result in a slightly different but acceptable value)
- Correctly indicates that the plant made 14,200 cars in 1910 (rounding may result in a slightly different but acceptable value)
- Shows relevant work to support these answers (e.g., the rate of increase is $5,000 - 400 = 4,600$ cars every three years. In 1907, $5,000 + 4,600 = 9,600$ cars would have been made. In 1910, $9,600 + 4,600 = 14,200$ cars would have been made.)

NOTE: A correct graphical or statistical solution process may receive full credit.

A **3-point** response does one of the following or similar:

- Gives one or more incorrect answers based on one minor error but demonstrates complete understanding of the problem and shows relevant work to support the answers
- Gives two correct answers but the supporting work is incomplete or flawed

A **2-point** response does one of the following or similar:

- Gives one or more incorrect answers based on two minor errors or one conceptual error but shows relevant work to support the answers
- Gives two correct answers with no supporting work
- Gives one correct answer with supporting work

Note: Interpreting the problem in a non-linear fashion is a conceptual error that will result in the response receiving a score of no greater than 2. For example:

$$\begin{aligned}400 \times 12.5 &= 5,000 \\5,000 \times 12.5 &= 62,500 \text{ (in 1907)} \\62,500 \times 12.5 &= 781,250 \text{ (in 1910)}\end{aligned}$$

A **1-point** response does one of the following or similar:

- Shows minimal understanding of the item and may show some relevant work to support the answers, but the results are incorrect based on major errors
- Gives one correct answer with no supporting work

A **0-point** response shows little or no understanding of the content of the item or leaves the item blank.

Item 29: Student Response 1

Michigan leads all states in the building of transportation equipment. The mass production of automobiles began in Detroit in 1901 when a company founded by Ransom E. Olds made about 400 cars. By 1904 the Olds plant made 5,000 cars a year.

- A If a constant rate of increase continued, how many cars did the Olds plant make during 1907?

about 9600 cars

Show your work.

$$\begin{array}{r} 5,000 \\ - 400 \\ \hline 4,600 \end{array}$$

$$\begin{array}{r} 5,000 \\ + 4,600 \\ \hline 9,600 \end{array}$$

- B During 1910? Show your work.

About 14,200 cars

$$\begin{array}{r} 9,600 \\ + 4,600 \\ \hline 14,200 \end{array}$$

Score Point: 4

This response gives the correct numbers of cars for 1907 in Part A (9,600) and in 1910 in Part B (14,200) with sufficient work shown.

Item 29: Student Response 2

Michigan leads all states in the building of transportation equipment. The mass production of automobiles began in Detroit in 1901 when a company founded by Ransom E. Olds made about 400 cars. By 1904 the Olds plant made 5,000 cars a year.

- A If a constant rate of increase continued, how many cars did the Olds plant make during 1907?

Show your work.

$$\begin{array}{l}
 01 = 400 \qquad 04 = 5000 \\
 5000 - 400 = 4600 \\
 4600 \div 3 \text{ yrs} = 1533 \text{ cars per year} \\
 400 + 6(1533) = \\
 9598
 \end{array}$$

The Olds plant produced about
9,598 cars in 1907

- B During 1910? Show your work.

$$\begin{array}{l}
 400 + 9(1533) = \\
 \text{the plant made } 14197 \text{ cars}
 \end{array}$$

Score Point: 4

This response gives the correct numbers of cars for 1907 in Part A (9,600) and in 1910 in Part B (14,200) with sufficient work shown.

Item 29: Student Response 3

Michigan leads all states in the building of transportation equipment. The mass production of automobiles began in Detroit in 1901 when a company founded by Ransom E. Olds made about 400 cars. By 1904 the Olds plant made 5,000 cars a year.

- A If a constant rate of increase continued, how many cars did the Olds plant make during 1907?

Show your work.

$$\begin{array}{r|l|l} 1901 & 1904 & 1907 \\ \hline 400 & 5,000 & 9,600 \end{array}$$

$$1907 - 9600$$

- B During 1910? Show your work.

$$\begin{array}{r|l|l|l|l} 1901 & 1904 & 1907 & & 1910 \\ \hline 400 & 5,000 & 9,600 & & 14,200 \end{array}$$

Score Point: 3

This response give sthe correct answer for 1907 in Part A (9,600) and for 1910 in Part B (14,200), but the work in both charts is insufficient.

Item 29: Student Response 4

Michigan leads all states in the building of transportation equipment. The mass production of automobiles began in Detroit in 1901 when a company founded by Ransom E. Olds made about 400 cars. By 1904 the Olds plant made 5,000 cars a year.

- A If a constant rate of increase continued, how many cars did the Olds plant make during 1907?

Show your work.

$$\begin{array}{r} 5000 \\ - 400 \\ \hline 4600 \\ + 4600 \\ \hline 9200 \end{array}$$

$$= 9,200 \text{ cars}$$

- B During 1910? Show your work.

$$\begin{array}{r} 9200 \\ + 4600 \\ \hline 13800 \end{array}$$

$$= 13,800 \text{ cars}$$

Score Point: 2

This response gives two incorrect answers based upon a conceptual error of not adding the increase to the original 400 with work shown.

Item 29: Student Response 5

Michigan leads all states in the building of transportation equipment. The mass production of automobiles began in Detroit in 1901 when a company founded by Ransom E. Olds made about 400 cars. By 1904 the Olds plant made 5,000 cars a year.

- A If a constant rate of increase continued, how many cars did the Olds plant make during 1907?

Show your work.

$$\begin{array}{r} 12.5 \\ 400 \overline{) 5000} \\ \underline{400} \\ 1000 \\ \underline{-800} \\ 2000 \\ \underline{8000} \\ 0000 \end{array}$$

$$\begin{array}{r} 12.5 \\ \times 5000 \\ \hline 625000 \end{array}$$

62500

- B During 1910? Show your work.

$$\begin{array}{r} 62500 \\ \times 12.5 \\ \hline 781250 \end{array}$$

781250

Score Point: 2

This response gives two incorrect answers based upon a conceptual error using the non-linear approach of multiplying by 12.5 with work shown.

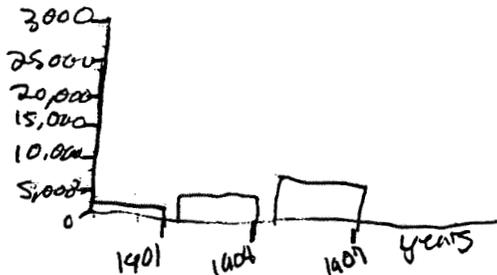
Item 29: Student Response 6

Michigan leads all states in the building of transportation equipment. The mass production of automobiles began in Detroit in 1901 when a company founded by Ransom E. Olds made about 400 cars. By 1904 the Olds plant made 5,000 cars a year.

- A If a constant rate of increase continued, how many cars did the Olds plant make during 1907?

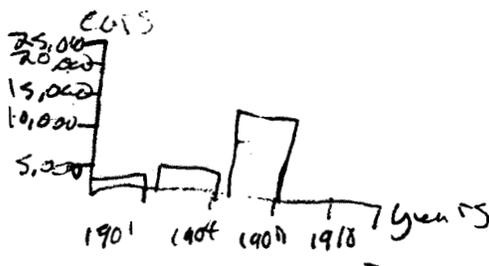
Show your work.

In 1907 the olds plant would of made 10,000 cars adding 5,000 cars over 3 years.



- B During 1910? Show your work.

In 1910 the olds company would of made 15,000 cars adding 5,000 cars.



Score Point: 1

This response gives two incorrect answers based upon a major error of using an increase of 5000 over 3 years with work shown.

Item 29: Student Response 7

Michigan leads all states in the building of transportation equipment. The mass production of automobiles began in Detroit in 1901 when a company founded by Ransom E. Olds made about 400 cars. By 1904 the Olds plant made 5,000 cars a year.

- A If a constant rate of increase continued, how many cars did the Olds plant make during 1907?

Show your work.

$$\begin{array}{r}
 5000 \\
 - 400 \\
 \hline
 4600
 \end{array}$$

~~4600~~ $\cdot 2 = 9,200$
~~13,800~~ cars in 1907

- B During 1910? Show your work.

$$\begin{array}{r}
 13,800 \\
 9,200 \\
 \hline
 27,600
 \end{array}
 \cdot 3 = \begin{array}{r}
 41,400 \\
 27,600 \\
 \hline
 69,000
 \end{array}$$

cars in 1910

Score Point: 0

This response gives two incorrect answers based upon a conceptual error of not adding the increase to the original 400 with work shown in Part A. Part B shows no understanding.

Item 42

42 Pauline joined an exercise group. Her goal is to complete at least 35 pushups per day. She begins with 1 pushup on day 1 and adds 3 additional pushups each day.

A On what day will she reach her goal? Show the work you used to find your answer.

B Write an explanation of how you found your answer.

Item 42: Scoring Rubric

MEAP Grade 8 Math 2002**Item # 42 Rubric**

A **4-point** response does all of the following:

- Determines that Pauline will reach her goal on day 13
- Provides a complete explanation for the answer, possibly accompanied by a chart or graph. For example, a chart may look like the following:

| Day | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|-------------------|---|---|---|----|----|----|----|----|----|----|----|----|----|
| Number of Pushups | 1 | 4 | 7 | 10 | 13 | 16 | 19 | 22 | 25 | 28 | 31 | 34 | 37 |

A **3-point** response does one of the following or similar:

- Determines that Pauline will reach her goal on day 13, but the explanation for the answer is incomplete or slightly flawed
- Determines that Pauline will reach her goal on day 13 and provides a complete explanation, but work contains a minor calculation error
- Gives an incorrect day for Pauline to reach her goal based on a minor error, but the explanation is complete
- Gives work and explanation that could be used to determine an answer, but does not indicate an answer.

A **2-point** response does one of the following or similar:

- Determines that Pauline will reach her goal on day 13 and attempts to explain the answer, but the explanation shows a major error or a flaw in reasoning
- Gives an incorrect day (or fails to give a day) for Pauline to reach her goal based on miscalculations and/or an incomplete/incorrect pattern, but the explanation for the answer or solution process is reasonable
- Determines that Pauline will reach her goal on day 13 and shows correct work, but provides no explanation

A **1-point** response does one of the following or similar:

- Determines that Pauline will reach her goal on day 13 with no supporting work (or flawed work) and no explanation
- Gives an incorrect day for Pauline to reach her goal based on miscalculations and shows some logic in the explanation of the answer, but the reasoning shows major flaws

A **0-point** response shows little or no understanding of the content of the item.

Item 42: Student Response 1

Pauline joined an exercise group. Her goal is to complete at least 35 pushups per day. She begins with 1 pushup on day 1 and adds 3 additional pushups each day.

A On what day will she reach her goal? Show the work you used to find your answer.

| | | | | | | | | | | | | | |
|--------|---|---|---|----|----|----|----|----|----|----|----|----|----|
| Day: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| Pushup | 1 | 4 | 7 | 10 | 13 | 16 | 19 | 22 | 25 | 28 | 31 | 34 | 37 |

She will reach
her goal in 13 days

B Write an explanation of how you found your answer.

I made a chart showing each day. As I went to the next day I did this until I got to 35 or the closest day over 35.

Score Point: 4

This response determines the correct number of days (13) with a complete explanation.

Item 42: Student Response 2

Pauline joined an exercise group. Her goal is to complete at least 35 pushups per day. She begins with 1 pushup on day 1 and adds 3 additional pushups each day.

A On what day will she reach her goal? Show the work you used to find your answer.

$$\begin{aligned}
 1 + 3(d-1) &= 35 \\
 1 + 3d - 3 &= 35 \\
 3d - 2 &= 35 \\
 3d - 2 + 2 &= 35 + 2 \\
 3d &= 37 \\
 3d/3 &= 37/3 \\
 d &= 12 \frac{1}{3}
 \end{aligned}$$

$$\text{Day} = \lceil 12 \frac{1}{3} \rceil = 13$$

Day 13

B Write an explanation of how you found your answer.

I wrote an equation for the amount of pushups. I used $1 + 3(d-1)$ to say she did one pushup the first day and 3 additional pushups after the first day. I used the $d-1$ to show that on $d=1$ she did one pushup. I set the equation = to 35 pushups and solved.

Score Point: 4

This response determines the correct number of days (13) with a complete explanation.

Item 42: Student Response 3

Pauline joined an exercise group. Her goal is to complete at least 35 pushups per day. She begins with 1 pushup on day 1 and adds 3 additional pushups each day.

A On what day will she reach her goal? Show the work you used to find your answer.

$$\begin{array}{ccccccccc} D1 & D2 & D3 & D4 & & & & & \\ \uparrow & \uparrow \\ 1 & +3 & +3 & +3 & +3 & +3 & +3 & +3 & +3 +1 \end{array}$$

in 13 days

B Write an explanation of how you found your answer.

I just added ~~3~~ 3 to each day then added 2.

Score Point: 3

This response determines the correct number of days (13), but the explanation is incomplete.

Item 42: Student Response 4

Pauline joined an exercise group. Her goal is to complete at least 35 pushups per day. She begins with 1 pushup on day 1 and adds 3 additional pushups each day.

A On what day will she reach her goal? Show the work you used to find your answer.

After $12\frac{1}{3}$ days
She will reach her goal.

$$1 + 3 = 4$$

$$4, 7, 10, 13, 16, 19,$$

$$22, 25, 28, 31, 34,$$

$$37$$

$$12$$

B Write an explanation of how you found your answer.

To find my answer I started at one added three to get four I added three to four which gave me seven. I kept adding three until I got up to 34. I counted how many times I added three, which was 12. She need one more push up to reach 35. So if she does three in a day and she needed one more she would need $\frac{1}{3}$ of a day. That gave me a total of $12\frac{1}{3}$ days.

Score Point: 3

This response determines an incorrect number of days ($12\frac{1}{3}$) based upon a minor error, but the explanation is complete.

Item 42: Student Response 5

Pauline joined an exercise group. Her goal is to complete at least 35 pushups per day. She begins with 1 pushup on day 1 and adds 3 additional pushups each day.

A On what day will she reach her goal? Show the work you used to find your answer.

① $1 + 3x = 35$
 -1
 $3x = 34$
 $\frac{3x = 34}{3}$
 $x = 11\frac{1}{3}$,
~~11~~ must round up

② Double Check
 $1 + 3 + 3 + 3 + 3 + 3$
 $1 + 3(11) = 34$
 $1 + 3(12) = 37$

③ on day 12
 day 12

B Write an explanation of how you found your answer.

I created an equation representing x as # of days in increase, adding one for the first day. The answer turned out to be a fraction, so I rounded up.

Score Point: 2

This response determines an incorrect number of days (12) based upon a major error but a reasonable explanation for the method.

Item 42: Student Response 6

Pauline joined an exercise group. Her goal is to complete at least 35 pushups per day. She begins with 1 pushup on day 1 and adds 3 additional pushups each day.

A On what day will she reach her goal? Show the work you used to find your answer.

$$\begin{aligned}(1+3)3 + 1 &= d \\ (4)3 + 1 &= d \\ 12 + 1 &= d \\ d &= 13\end{aligned}$$

Pauline will reach her goal on her 13th day.

B Write an explanation of how you found your answer.

You needed to add the first push-up to the second day. $(1+3)$
Then you needed to times that answer by 3. Then add one to make
13 days.

Score Point: 1

This response determines the correct number of days (13) with flawed work and no explanation.

Item 42: Student Response 7

Pauline joined an exercise group. Her goal is to complete at least 35 pushups per day. She begins with 1 pushup on day 1 and adds 3 additional pushups each day.

A On what day will she reach her goal? Show the work you used to find your answer.

$$\begin{array}{r} 11 \\ 3 \overline{)35} \\ \underline{-3} \\ 05 \\ \underline{-3} \\ 2 \end{array}$$

She will reach her goal on day 11

B Write an explanation of how you found your answer. If she wanted to complete 35 pushups and she adds 3 each Day you just divide 35 by 3.

Score Point: 0

This response determines an incorrect number of days (11), and the work and explanation show no understanding of the item.

**Michigan Educational Assessment Program
Statewide Test Item Analysis
Mathematics Grade 8
Winter 2002**

District: MICHIGAN DEPARTMENT OF TREASURY
School: STATEWIDE SCHOOL DATA
Codes: District- 99999 School- 0001
Run Date: 07/26/2002

| Multiple Choice Percent Answering by Response | | | | | | | Constructed Response Percent Receiving Number of Points | | | | | | | | | | Percent Receiving Condition Codes | | | | |
|---|----------------|-----|-----|-----|-----|-----------|---|----------------|-----|-----|-----|-----|-----|-----|-----|-----|--------------------------------------|---|---|---|---|
| Item No. | Benchmark Code | A | B | C | D | Omit/Mult | Item No. | Benchmark Code | 0.0 | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | A | B | C | D |
| Patterns, Relationships, and Functions | | | | | | | Patterns, Relationships, and Functions | | | | | | | | | | | | | | |
| 05 | 1MS3 | 9 | 9 | 10 | 73* | 0x | 42 | 1MS5 | 21 | 5 | 5 | 4 | 7 | 5 | 13 | 4 | 32 | 0 | 0 | 0 | 4 |
| 10 | 2MS1 | 25 | 45* | 23 | 6 | 1 | Numerical and Algebraic Operations and Analytical Thinking | | | | | | | | | | | | | | |
| 11 | 1MS3 | 6 | 52* | 26 | 16 | 0x | 29 | 1MS4 | 35 | 8 | 8 | 3 | 11 | 1 | 3 | 2 | 24 | 1 | 0 | 0 | 4 |
| 18 | 1MS1 | 1 | 3 | 77* | 18 | 1 | | | | | | | | | | | | | | | |
| 33 | 2MS4 | 23 | 4 | 7 | 66* | 1 | | | | | | | | | | | | | | | |
| Geometry and Measurement | | | | | | | | | | | | | | | | | | | | | |
| 07 | 3MS2 | 12 | 22 | 52* | 12 | 1 | | | | | | | | | | | | | | | |
| 08 | 1MS6 | 18 | 8 | 54* | 20 | 0x | | | | | | | | | | | | | | | |
| 13 | 2MS2 | 14 | 8 | 10 | 67* | 1 | | | | | | | | | | | | | | | |
| 16 | 3MS3 | 11 | 12 | 18 | 59* | 0x | | | | | | | | | | | | | | | |
| 17 | 2MS2 | 7 | 74* | 9 | 10 | 0x | | | | | | | | | | | | | | | |
| 22 | 1MS1 | 56* | 8 | 26 | 9 | 0x | | | | | | | | | | | | | | | |
| 27 | 3MS4 | 22 | 53* | 20 | 4 | 1 | | | | | | | | | | | | | | | |
| 28 | 2MS2 | 8 | 7 | 65* | 19 | 0x | | | | | | | | | | | | | | | |
| 40 | 3MS2 | 53* | 32 | 10 | 5 | 1 | | | | | | | | | | | | | | | |
| 41 | 2MS5 | 19 | 10 | 24 | 47* | 1 | | | | | | | | | | | | | | | |
| Data Analysis and Statistics | | | | | | | | | | | | | | | | | | | | | |
| 01 | 2MS1 | 56* | 1 | 39 | 3 | 0x | | | | | | | | | | | | | | | |
| 06 | 3MS4 | 18 | 64* | 10 | 8 | 0x | | | | | | | | | | | | | | | |
| 09 | 1MS3 | 13 | 6 | 5 | 76* | 0x | | | | | | | | | | | | | | | |
| 12 | 1MS2 | 3 | 5 | 78* | 14 | 0x | | | | | | | | | | | | | | | |
| 19 | 2MS2 | 58* | 17 | 14 | 10 | 1 | | | | | | | | | | | | | | | |
| 23 | 2MS4 | 9 | 4 | 7 | 80* | 0x | | | | | | | | | | | | | | | |
| 24 | 3MS4 | 17 | 7 | 72* | 4 | 0x | | | | | | | | | | | | | | | |
| 26 | 2MS1 | 7 | 7 | 13 | 72* | 0x | | | | | | | | | | | | | | | |
| 36 | 2MS4 | 15 | 61* | 15 | 9 | 1 | | | | | | | | | | | | | | | |
| Number Sense and Numeration | | | | | | | | | | | | | | | | | | | | | |
| 14 | 1MS4 | 56* | 33 | 6 | 4 | 0x | | | | | | | | | | | | | | | |
| 20 | 2MS5 | 12 | 5 | 23 | 60* | 0x | | | | | | | | | | | | | | | |
| 25 | 1MS1 | 79* | 15 | 3 | 2 | 0x | | | | | | | | | | | | | | | |
| 35 | 3MS3 | 56* | 24 | 10 | 8 | 1 | | | | | | | | | | | | | | | |
| 38 | 3MS2 | 7 | 24 | 62* | 7 | 1 | | | | | | | | | | | | | | | |
| Numerical and Algebraic Operations and Analytical Thinking | | | | | | | | | | | | | | | | | | | | | |
| 03 | 2MS1 | 11 | 25 | 7 | 56* | 0x | | | | | | | | | | | | | | | |
| 15 | 2MS5 | 16 | 50* | 23 | 9 | 1 | | | | | | | | | | | | | | | |
| 21 | 1MS2 | 4 | 17 | 50* | 28 | 1 | | | | | | | | | | | | | | | |
| 30 | 1MS4 | 37 | 47* | 4 | 11 | 1 | | | | | | | | | | | | | | | |
| 34 | 2MS1 | 64* | 12 | 14 | 9 | 1 | | | | | | | | | | | | | | | |
| 39 | 1MS2 | 4 | 5 | 86* | 4 | 1 | | | | | | | | | | | | | | | |
| Probability and Discrete Mathematics | | | | | | | | | | | | | | | | | | | | | |
| 02 | 2MS1 | 65* | 14 | 6 | 14 | 0x | | | | | | | | | | | | | | | |
| 04 | 1MS1 | 3 | 19 | 73* | 5 | 0x | | | | | | | | | | | | | | | |
| 31 | 2MS1 | 10 | 55 | 30* | 5 | 1 | | | | | | | | | | | | | | | |
| 32 | 2MS3 | 12* | 51* | 26 | 10 | 1 | | | | | | | | | | | | | | | |
| 37 | 1MS1 | 43* | 9 | 12 | 35 | 1 | | | | | | | | | | | | | | | |
| Number of Students Included: 122961 | | | | | | | | | | | | | | | | | | | | | |

Condition Codes for the Constructed-Response Items:

- A Off-task
- B Illegible
- C Written in language other than English
- D Blank/refused to respond

Using the Benchmark Codes

You can link the individual items to their corresponding benchmark in the *Michigan Curriculum Framework*, approved in 1996.

Each benchmark code contains four characters. The first character, an Arabic numeral, identifies the content standard under the specific strand. The next two characters represent the grade level column designation in the content standards documents (ES = Elementary School, MS = Middle School, and HS = High School). The number following these letters represents the specific benchmark in the column designated by the grade level.

EXAMPLE

An item with benchmark code 1MS2 under Geometry and Measurement is referring to content standard 1, Shape and Shape Relationships. Within that content standard, you need to look at middle school benchmark number 2, "generalize the characteristics of shapes and apply their generalizations to classes of shapes," to find the match.

CAUTION

Making inferences about students based on their answers to individual items is inadvisable due to the low reliability of single item measures. These data should only be used to make inferences about the performance of groups that are classroom size or larger.

Omit/Mult = Omits and Multiple Responses
* Number of students present rounds to zero